Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method of performing two-dimensional Nuclear Magnetic Resonance (NMR) spectroscopy on a hyperpolarized sample, which method comprises the steps of:
   - hyperpolarizing a sample which comprises a first nuclear species (I) and a second nuclear species (S), with the Hamiltonian $H = H_S + H_{IS} + H_I$ using DNP, wherein the NMR active nuclei receive hyperpolarization and transformation of the sample to a liquid state;
   - performing two-dimensional NMR spectroscopy on the sample and thereby producing at least two NMR spectra with the use of a sequence of rf-pulses, wherein the sequence of rf-pulses ~~pulse sequence~~ comprises at least two rf-pulses on the same nuclei, and wherein the pulse sequence is adapted for a hyperpolarized sample in such a way that it uses a single scan, an efficient trajectory in a t_S-t_{IS} plane and produces a square array of observed points in a square portion of a two time space;
   - analysing the at least two NMR spectra in order to obtain a characterization of the sample.

2. (Cancelled)

3. (Cancelled)

4. (Cancelled))

5. (Cancelled)

6. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

14. (Previously presented) The NMR spectroscopy method according to claim 1, wherein the pulse sequence spans a trajectory in a two-dimensional evolution time space (t_S, t_{IS}), said pulse sequence comprises the step of:

    - (300) starting from the point (0,0), with an 90° pulse on S, observing N+1 points (i,i) up to point (N,N);

    - (305) performing a 180° pulse on I~~)~~, which leads to (N,-N);

    - (310) waiting one time unit, leading to (N+1,-N+1);

    - (315) performing a 180° pulse on both I and S, leading to (-N-1,-N+1);

    - (320) observing points up to (N-2,N);

    - (325) performing a 180° pulse on I, leading to (N-2,-N);

    - (330) observing points up to (N+1,-N+3).

15. (Previously presented) The NMR spectroscopy method according to claim 1, wherein the pulse sequence spans a trajectory in a two-dimensional evolution time space (t_S, t_{IS}), said pulse sequence comprises the step of::

    - (300b) starting from the point (0,0), with an 90° pulse on S, observing N+1 points (i,i) up to point (N,N);

    - (305b) performing a 180° pulse on I, which leads to (N,-N);

    - (310b) waiting one time unit, leading to (N+1,-N+1);

    - (315b) performing a 180° pulse on both I and S, leading to (-N-1,-N+1);

    - (320b) observing points up to (N-2,N);

    - (340b) performing a 180° pulse on S, which reverses both time signs and leads to (-N+2,-N);

- (345b) observing points up to (N,N-2);
- (350b) performing a 180° pulse on I leading to (N,-N+2);
- (355b) observing points up to (N+1,-N+3).

16. (Previously presented) A method of performing two-dimensional Nuclear Magnetic Resonance (NMR) spectroscopy on a hyperpolarized sample, which method comprises the steps of:
    - hyperpolarizing a sample which comprises a first nuclear species (I) and a second nuclear species (S), with the Hamiltonian $H = H_S + H_{IS} + H_I$ using DNP, wherein the NMR active nuclei receive hyperpolarization and transformation of the sample to a liquid state;
    - performing two-dimensional NMR spectroscopy on the sample and thereby producing at least two NMR spectra with the use of a sequence of rf-pulses, wherein pulse sequence comprises at least two rf-pulses on different nuclei, and wherein pulse sequence is adapted for a hyperpolarized sample in such a way that it uses a single scan, an efficient trajectory in a t_S-t_{IS} plane and produces a square array of observed points in a square portion of a two time space,;
    - analyzing the at least two NMR spectra in order to obtain a characterization of the sample.

17. (Previously presented) The NMR spectroscopy method according to claim 16, wherein the pulse sequence spans a trajectory in a two-dimensional evolution time space (t_S, t_{IS}), said pulse sequence comprises the step of:
    - (300) starting from the point (0,0), with an 90° pulse on S, observing N+1 points (i,i) up to point (N,N);
    - (305) performing a 180° pulse on I, which leads to (N,-N);
    - (310) waiting one time unit, leading to (N+1,-N+1);
    - (315) performing a 180° pulse on both I and S, leading to (-N-1,-N+1);
    - (320) observing points up to (N-2,N);
    - (325) performing a 180° pulse on I, leading to (N-2,-N);
    - (330) observing points up to (N+1,-N+3).

18. (Previously presented) The NMR spectroscopy method according to claim 16, wherein the pulse sequence spans a trajectory in a two-dimensional evolution time space (t_S, t_{IS}), said pulse sequence comprises the step of::

- (300b) starting from the point (0,0), with an 90° pulse on S, observing N+1 points (i,i) up to point (N,N);

- (305b) performing a 180° pulse on I, which leads to (N,-N);

- (310b) waiting one time unit, leading to (N+1,-N+1);

- (315b) performing a 180° pulse on both I and S, leading to (-N-1,-N+1);

- (320b) observing points up to (N-2,N);

- (340b) performing a 180° pulse on S, which reverses both time signs and leads to (-N+2,-N);

- (345b) observing points up to (N,N-2);

- (350b) performing a 180° pulse on I leading to (N,-N+2);

- (355b) observing points up to (N+1,-N+3).